70cm DISCOVERY
LINEAR AMPLIFIER

(with GS – 31)

Operating Manual

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CAUTION

There are dangerously high voltages inside the amplifier when the power is switched on. DO NOT remove the covers unless the power has been disconnected and sufficient time has elapsed for the capacitors to discharge.

NOTE

The 70cm Discovery is capable of a greater power than the CW rating shown in the specifications. In order to achieve the stated PEP output, the amplifier must be capable of operating CW at the same level for short periods. Do not try to operate the amplifier at greater than the recommended level.

If the amplifier is operated for long periods at levels greater than the recommended ones, then damage may occur. This applies particularly to the GS 31 valve, so great care should be taken not to exceed 1Amp plate current or to drive with more than 100W continuous wave drive. Also, care should be taken not to exceed 1.5 : 1 SWR.

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1. SPECIFICATIONS

Function……The 70cm Discovery is a desk top linear RF amplifier with a nominal output of 800W covering the range 430-440MHz for amateur radio use.

Type of emission……SSB/FM/CW/RTTY

Dimensions……14in wide x 9.75in high x 17in deep
360mm x 250mm x 430mm

Weight……..25kg

Output power……..……800W CW/SSB

Gain……..……11dB nominal

Power requirements……..……230V AC at 15A, 50/60Hz

Duty cycle……Full O/P with normal amateur service

Cooling……..……Forced air cooling

Frequency coverage……..……430-440 MHz

Input impedance……..……50 Ohms with tuned I/P circuit

Valve……single GS 31 triode

Harmonics……3rd harmonic: better than –45dB

Plate voltage……..……SSB: 2800V DC

Cabinet……chassis – Zintec steel, covers – aluminium
RF compartment – aluchromed aluminium

Antenna relay……24VDC antenna relays automatically transfer the driver to the antenna when in STBY or OFF. Standard in-built are coaxial O/P relay and short throw I/P relay.
The amplifier requires a relay contact in the driver to key the amplifier.

Metering…… ……Plate current, Grid current and RF O/P

Protection…… AC fuses, Grid over-current, Plate over current, Internal valve flash-over, over-drive, soft start, Warm-up timer

2. INTRODUCTION

The 70cm Discovery is a high quality linear amplifier, which is designed around a GS 31 medium mu triode in grounded grid configuration. The amplifier is forced air cooled to give you the ability to operate at full output power for as long as you wish. The recommended maximum drive is 100Watts.
The new model of the Discovery features a specially designed Triode control board by G3SEK. This control board incorporates all the following protection features:- Grid over-current, Plate over-current, Internal valve flashover and Overdrive. It also has sequenced relays and high speed switching relay.
The GS 31 must be allowed to warm up properly hence a 3 min. start up timer is fitted. When the amplifier is switched on, the yellow WAIT/GRID LED comes on. After 3 min has elapsed the WAIT light will go out and the green READY LED will come on allowing you to operate the PTT.
It is recommended that you use a Bird (or equivalent) power meter capable of measuring 1500W at the correct frequency.
Please read the instructions carefully before operating the equipment. RF amplifiers at this power level and frequency can be easily damaged by improper use. Please follow the precautions on page 1 of this manual.

The Discovery is fully self-contained and has three separate voltages:-

1. HIGH VOLTAGE which is 2800V, the main voltage applied to the valve anode.
2. HEATER SUPPLY which is 13V at 3A.
3. CONTROL VOLTAGE which is 20V used for the LED control condition of the amplifier, also for pulling in the Tx/Rx relays.

3. INSTALLATION

SETTING UP

a) Unpack the amplifier and check that it is undamaged. The carton should also contain a power cable, operating manual, phono plug (for relay switching lead) and spare fuse. Please retain the packing and box should it be necessary to ship it or move it to another location.

b) Ensure you have a reasonable airflow around the site you have chosen to install your amplifier. Do not enclose the cabinet or restrict the airflow in any way. Try to avoid extremes of heat, humidity or dust in order to give many hours of trouble-free operation.

c) Ensure ALL connectors to be used by yourself are of a sufficient electrical standard to carry the higher RF output generated by the amplifier. To properly tune the amplifier a high quality Wattmeter (e.g. Bird thruline) should be used to measure the output and, if possible, a similar meter between the driver and the amplifier to correctly measure the input.

d) NEVER attempt to operate the amplifier without first connecting an antenna or 50Ohm dummy load. Check the SWR of the antenna with the amplifier in the OFF or STBY position and do not operate the amplifier if the SWR is greater than 2 : 1.

e) Check that the front panel switches are in the STBY and OFF positions.

CONNECTIONS

a) POWER CABLE. The amplifier is supplied with a 3-wire Mains cable terminated in an IEC connector to go into the socket on the rear panel. The other end is left free for you to connect whichever plug is suitable for your electricity supply. The supply must be 230VAC, single phase, 50/60Hz.

b) OUTPUT COAX. Any good quality 50 Ohm coax capable of carrying up to 1500W at 430MHz is suitable. This needs an N-type connector to go on to the amplifier and whatever connector is required for your wattmeter.

c) INPUT COAX. Good quality 50 Ohm coax with an N-type connector to the amplifier and a connector of your choice for your driver.

d) RELAY SWITCHING LEAD. A phono plug is supplied for you to make a lead to go into the PTT socket on the rear of the amplifier and connect to the antenna relay on your driver. This cable sends the keying signal from your driver to switch the amplifier to transmit. Do not apply any voltage to the amplifiers relay control as it has its own in-built power supply.

4. OPERATING CONTROLS

FRONT PANEL CONTROLS

ON/OFF SWITCH……....Mains power on and off

STBY/TX……Amplifier standby / operate

PLATE METER……..0 – 1.5A, monitors the plate current of the valve

GRID METER……...0 – 400mA, monitors the grid current which should not rise above 300mA

GRID / RF OUT……..switches the grid meter to monitor relative RF O/P
NB. On the 70cm Discovery there is no relative RF O/P, so the switch only operates in the GRID position.

(LOAD CONTROL……..Adjusts the loading of the strip-line)
Internally preset

TUNE CONTROL……..…….Adjusts the tuning of the strip-line

ANODE LED……...Indicates an internal valve flash-over (for re-set see page 7)

WAIT/GRID LED……..Lit until the valve has warmed up and then goes out when the amplifier is ready to use
If this LED comes on during use it indicates that there is a fault (see note on page 7 for reset)

READY LED…… ... .Shows amplifier is ready for operation

TX LED……Shows when the amplifier is ON AIR

REAR PANEL

CIRCUIT BREAKER…….10A, press to re-set

MAINS……..IEC connector for mains cable, 230VAC

TX…….N – type connector, coaxial INPUT to amplifier from driver

ANT…….N – type connector, coaxial OUTPUT to antenna through a suitable power meter

PTT…….Phono connector for relay switching lead

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5. OPERATION

SET-UP

Connect all the cables as previously described in the manual, then double-check. When you are satisfied that everything is correct and the STBY/TX switch is on STBY, switch the amplifier on. The WAIT light should be on. After approximately 3 minutes the WAIT light should go out and the READY light should come on, indicating that the valve has warmed up and is ready for operation. Now put the STBY switch to TX, which puts it into the operate mode. With no RF drive applied, key the amplifier and check that the Plate meter shows a standing current of about 80 – 100 mA. The green TX LED will be on when the amplifier is keyed.

TUNE-UP

Now set your driver to about 30W output, in either CW or FM mode, and using the two dials tune for maximum output on your power meter. This should indicate about 300W output. The amplifier will give about 800W RMS when 80W of drive is now applied with very slight adjustments being necessary.
In the tune mode with 600W O/P, the plate meter should rise to about half scale.

CAUTION. Maximum grid current should NEVER exceed 300mA.

The amplifier is now ready for operation.

OPERATION

The mode of operation, SSB or CW, can now be selected and operate as normal. When the amplifier is in the STBY position the RF goes straight through from the transceiver to the antenna, and when it is in the TX position the amplifier comes into operation.

To key the amplifier, an earth on transmit is required from the transceiver (relay) to the PTT socket on the back of the amplifier. When the transceiver and amplifier are keyed, the green TX LED indicator on the front panel is lit.

During operation, keep a careful eye on the Grid meter making sure it does not exceed 300mA.

PROTECTION and RESET

There are two kinds of reset fitted to this model of 70cm Discovery, hard and soft.
Soft reset: If the yellow GRID LED comes on - this is for faults such as over-drive, over-grid current and over-plate current. To reset, simply de-key the PTT.
Hard reset: If the red ANODE LED comes on - this is for major problems e.g. Internal valve flash-over. To reset, switch the OFF/ON switch to OFF and ON again.

OPERATING PRECAUTIONS

To ensure safe and reliable operation please regard the following precautions:-

HIGH VOLTAGES CAN BE LETHAL. Never try to operate your amplifier with the covers removed. If it is necessary to work inside the cabinet, always disconnect the Mains supply and allow the capacitors to discharge fully.

Never operate the amplifier into a load or antenna with an SWR greater than 2 : 1.

Always tune the amplifier for resonance using low drive at the operating frequency.

The components in the amplifier are designed to be used within the parameters of the specifications on page 2 of this manual. Excessive drive giving output in excess of these specifications will shorten valve life and could affect the reliability of other components.

WARRANTY

Linear Amp UK Ltd warrants to the original purchaser that this product shall be free from defects in material or workmanship for 12 months from the date of the original purchase. Valves are excluded from this warranty.

Notification should be given as soon as possible after discovering a possible defect. Carriage charges for any parts or units submitted for replacement or repair under this warranty must be paid by the purchaser.

Correct maintenance, repair and use are important to insure proper performance from this product. Carefully read the operating manual. This warranty does not apply to any defect Linear Amp UK Ltd determines is caused by (1) improper maintenance or repair, including the installation of parts or accessories that do not conform to the quality and specification of the original parts; (2) misuse, abuse, neglect or improper installation; (3) accidental or intentional damage; (4) acts of God.

Linear Amp UK Ltd is not responsible for damage to other equipment or property or any other consequential or incidental damage of any kind.

This warranty is **not transferable** from the original owner on sale of the unit to another.

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